Published in final edited form as:

BJU Int. 2020 January ; 125(1): 38–48. doi:10.1111/bju.14888.

Health-Related Quality of Life among Non-Muscle-Invasive Bladder Cancer Survivors: A Population-Based Study

Ahrang Jung, PhD, RN¹, Matthew E. Nielsen, MD, MS, FACS^{1,3}, Jamie L. Crandell, PhD², Mary H. Palmer, PhD, RN, FAAN, AGSF², Sophia K. Smith, PhD⁴, Ashley Leak Bryant, PhD, RN-BC, OCN^{1,2}, Deborah K. Mayer, PhD, RN, AOCN, FAAN^{1,2}

¹Lineberger Comprehensive Cancer Center, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

²School of Nursing, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

³School of Medicine, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

⁴School of Nursing, Duke University, Durham, North Carolina, USA

Abstract

PURPOSE—To examine the effect of non-muscle-invasive bladder cancer (NMIBC) diagnosis and treatment on survivors' quality of life (QOL).

PATIENTS AND METHODS—Of the 5,979 NMIBC population diagnosed between 2010–2014 in North Carolina, 2,000 patients were randomly selected to be invited into this cross-sectional study. Data were collected by postal mail survey. European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core (EORTC QLQ-C30) and NMIBC-specific module (QLQ-NMIBC24) were included to measure QOL. Descriptive statistics, t-tests, ANOVA, and Pearson's correlation were utilized to describe demographics and to assess how QOL varied by sex, cancer stage, time since diagnosis, and treatment.

RESULTS—A total of 398 survivors returned questionnaires (response rate: 23.6%). The mean QOL scores for QLQ-C30 (range 0 – 100, higher = better QOL in all domains but symptoms) were: global health status 73.6, function domains ranged 83.9 – 86.5, and top five symptoms (insomnia, fatigue, dyspnea, pain, and financial difficulties) ranged 14.1 – 24.3. The lowest NMIBC-specific QOL domain was sexual issues including sexual function, enjoyment, problems, and intimacy. Females had worse bowel problems, sexual function, and sexual enjoyment than males but better sexual intimacy and less concerns about contaminating their partner. Stage Ta had the highest global health status, followed by T1 and Tis. QOL did not vary by time since diagnosis except for sexual function. The cystectomy group (n= 21) had worse QOL in sexual function, discomfort with sexual intimacy, sexual enjoyment, and male sexual problems than the non-cystectomy group (n= 336).

CONCLUSION—NMIBC survivors face a unique burden associated with their diagnosis and the often-lifelong surveillance and treatment regimens. The finding has important implications for the design of tailored supportive care interventions to improve QOL for NMIBC survivors.

Introduction

Non-muscle-invasive bladder cancer (NMIBC) survivors represent the majority (75%) of incident and prevalent cases of bladder cancer (1). NMIBC survivors are subject to a unique burden, typically lifelong programs of surveillance and repeated treatments. The treatment of NMIBC includes the transurethral resection of bladder tumor (TURBT) with or without intravesical chemotherapy or immunotherapy. Depending on the chosen strategy, these treatments can be associated with several complications in the short- and long-term, such as pain, urinary problems, gastro-intestinal problems, infection, or inflammation (2). Even with the recommended treatments, up to 33% of NMIBC survivors have a recurrence of NMIBC within the first year, increasing to approximately 50% by five years (3). The risk of progression to muscle-invasive bladder cancer (MIBC) is much more heterogeneous. It occurs very rarely in the lower risk majority, but high-risk subgroups of NMIBC survivors face risks of up to 45% within five years (4). Due to the high rate of recurrence or progression, NMIBC survivors are required to have repeated invasive surveillance cystoscopies (as frequent as every three months) and intravesical treatments (5). Thus, NMIBC survivors live with an exceptional burden of surveillance and possible treatment for the rest of their lives after diagnosis, potentially affecting their quality of life (QOL).

Even though most bladder cancer survivors are living with NMIBC, much of the existing QOL literature in bladder cancer addresses the burdens of patients with MIBC, not NMIBC, and focuses primarily on the experience of patients receiving cystectomy with different urinary diversion methods as opposed to chemoradiation (6). Relatively fewer studies have assessed the impact of both the disease and the treatment on QOL in NMIBC patients to date. Moreover, although a few studies have been conducted with a population-based sample of bladder cancer survivors, there is currently no population-based QOL study focused solely on NMIBC survivors (7).

Despite the unique burden of NMIBC survivors, including frequent recurrences, repeated surveillance cystoscopies and treatments, and the highest lifetime medical cost per person among all cancers (8,9), little is known about the impact of NMIBC and its treatment on QOL in NMIBC survivors. Therefore, we aimed to address gaps in our understanding of the disease and treatment effects on QOL in NMIBC survivors. Specifically, the aims of the present study were to: a) describe QOL in a population-based sample of NMIBC survivors; and b) examine the impact of sex, cancer stage, time since diagnosis, and treatment on QOL.

Patients and Methods

Study Population

NMIBC population was identified through the North Carolina Central Cancer Registry (CCR), which is the cancer data center for the population of North Carolina. Eligible individuals: a) had a confirmed diagnosis of NMIBC (stage Ta, T1, or carcinoma in situ); b)

were 18 years or older; c) were one to six years post-diagnosis; and d) had completed initial cancer treatment. A total of 5,979 NMIBC patients were listed in the North Carolina CCR who had been diagnosed between 2010 and 2014 and who met the inclusion criteria. Of these, 2,000 potential participants were randomly selected and stratified by sex (1,500 males and 500 females to reflect the sex ratio of the target population).

Data Collection Procedures

The potential participants were contacted by mail, according to Dillman's method for mailed surveys (10). The initial contact was through a mailed survey packet, which contained a letter of introduction, CCR brochure, consent form, future contact form, and self-administered questionnaire with a postage-paid return envelope. One week after the survey packet was sent, reminder postcards were sent to the potential participants in order to encourage participation. The data were double-entered by the first author and one trained research assistant, and all the discrepancies were corrected by consulting the original survey data. The study was approved by the institutional review board at the University of North Carolina at Chapel Hill.

Measures

Demographics and clinical characteristics were obtained from the North Carolina CCR information and participants' self-reports. QOL was assessed with the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30) version 3.0 and a NMIBC-specific module (QLQ-NMIBC24) (11,12). The QLQ-C30 has 30 items and is comprised of a global health status scale, five functional scales (physical, role, emotional, cognitive, and social) and nine symptom scales/items (fatigue, nausea and vomiting, pain, dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties). Each item in the global health status scale has a numerical rating scale from 1 to 7, and each item in the function and symptom scales has a four-point Likert scale from 1 ('not at all') to 4 ('very much'). The measure was developed specifically for assessing the health-related QOL of cancer patients and has been used previously in the bladder cancer population (13–15). The QLQ-NMIBC24 is a 24-item questionnaire specifically for patients with NMIBC and assesses 11 domains (urinary symptoms, malaise, future worries, bloating and flatulence, intravesical treatment issues, risk of contaminating partner, sexual intimacy, sexual enjoyment, sexual function, male sexual problems, and female sexual problems). Each item has a four-point Likert scale from 1 ('not at all') to 4 ('very much'). For scoring the QLQ-C30 and QLQ-NMIBC24, raw scores of each domain were calculated by averaging the response scores of comprised items in each domain. A linear transformation was then performed to standardize the raw scores, such that scores for each domain range from 0 to 100. Higher scores indicate higher (better) levels of global health status or functioning, or higher (worse) levels of symptoms.

Data Analysis

Chi-squared tests and t-tests were used to determine whether there was a significant difference between the participants and the non-participants. Descriptive statistics were computed to examine the demographics, clinical characteristics, and QOL in NMIBC survivors. T-tests, analysis of variance (ANOVA), and Pearson's correlation were used to

examine whether the QOL varied by sex, cancer stage, time since diagnosis, and treatment. In addition, two sets of post-hoc analyses were conducted: 1) comparing QOL in cystectomy vs. non-cystectomy using t-tests and 2) comparing QOL among the non-cystectomy groups using ANOVA, with step-down tests where necessary. All the statistical analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC).

Results

Sample Characteristics

Of the 2,000 prospective participants who were mailed the surveys, 9 were duplicates, 153 packages were returned undeliverable, and 154 patients did not meet the inclusion criteria (no NMIBC by patient report, $n = 6$; unable to read and write a questionnaire by family report, $n = 9$; or deceased, $n = 139$) (Figure 1). A total of 1,684 survivors were eligible and 398 (23.6%) participants returned their surveys. The participants were more likely to be white than non-participants (94.5% vs. 88.1%, $p < .001$), but other demographic and clinical characteristic information from the registry did not differ (Table S1: Demographics for the overall study population are provided in supporting information). Twenty-two participants who did not complete the main outcome (QOL) instrument were excluded from the analyses, leaving 376 participants whose responses were included in the analyses. The 22 participants whose data were excluded were more likely to be older than those whose data were included in the analyses (81.5 ± 6.7 vs. 72.2 ± 9.2 , $p < .001$), but other demographic and clinical characteristic information from the registry did not differ. Table 1 indicates the sample characteristics of the 376 participants who were included in the analyses. The majority were male, white, and non-Hispanic. Mean age at study enrollment was 72.2 years, and 83.2% ($n = 313$) were aged 65 years or older. The mean years since diagnosis was 3.4 years. A majority of participants (73.4%, $n = 276$) reported having received TURBT as the primary treatment whereas only 5.6% ($n = 21$) had received cystectomy. Of all the participants, 36.2% and 43.4% had received intravesical chemotherapy and immunotherapy, respectively.

QOL

The average global health status score was 73.6 and the average functioning scores ranged from 83.9 to 86.5 (Table 2). The average scores of the top five symptom scales/items in QLQ-C30 (insomnia, fatigue, dyspnea, pain, and financial difficulties) ranged from 14.1 to 24.3. The average scores for QLQ-NMIBC24 ranged from 5.0 to 48.5. The domains with the lower QOL were sexual function, sexual enjoyment, male/female sexual problems, sexual intimacy, urinary symptoms, future worries, and bloating and flatulence.

QOL by sex.—Females had significantly higher levels of constipation and diarrhea (both $p = .02$; Table 3). Males had significantly better sexual function ($p < .0001$) and sexual enjoyment ($p < .0001$) than females. However, males reported significantly more discomfort with sexual intimacy ($p = .01$) and higher levels of concern about contaminating their partners ($p = .03$).

QOL by cancer stage at initial diagnosis.—Global health status, physical functioning, role functioning, social functioning, fatigue, dyspnea, financial difficulties, and intravesical treatment issues varied significantly by cancer stage at initial diagnosis (all $p < .05$; Table 3). The highest level of global health status was shown in stage Ta, followed by stages T1 and Tis. Step-down tests indicated the only significant pairwise difference in global health status was between stages Ta and Tis ($p = .02$). Stage Ta had the best physical, role, and social functioning, and had the least fatigue, dyspnea, and financial difficulties. Stage Tis had the worst physical functioning and dyspnea; Stage T1 had the worst role functioning, social functioning, fatigue, and financial difficulties. However, step-down tests indicated only stages Ta and T1 differed significantly in physical functioning ($p = .01$), role functioning ($p = .01$), social functioning ($p < .01$), fatigue ($p = .01$), dyspnea ($p = .04$), and financial difficulties ($p < .001$). The highest level of intravesical treatment issues was reported in stage Tis, followed by stage T1 and stage Ta. Step-down tests showed stages Ta and T1 both had significantly lower intravesical treatment issues than stage Tis (both $p < .05$).

QOL by time since diagnosis.—The only significant relationship was with sexual function, which was better further from diagnosis ($p = .04$; Table 3).

QOL by treatment.—Sexual intimacy, risk of contaminating partner, and male sexual problems varied significantly by treatment (Table 3). The cystectomy group had the highest level of discomfort with sexual intimacy and the most male sexual problems, whereas the TURBT + immunotherapy group had the lowest discomfort with sexual intimacy and the least male sexual problems. The highest level of concerns about contaminating partner was found in the TURBT + chemotherapy + immunotherapy group, and the lowest was in TURBT only.

After observing the large QOL differences between cystectomy and non-cystectomy treatments, we conducted post-hoc analyses with the goal of understanding how cystectomy was associated with QOL and how QOL varied within the non-cystectomy treatments. When comparing cystectomy vs. non-cystectomy, non-cystectomy had significantly better sexual function ($p < .01$), better sexual intimacy ($p < .01$), higher sexual enjoyment ($p = .01$), and lower levels of male sexual problems ($p = .03$) than cystectomy. In comparing the non-cystectomy groups, the concern about contaminating partner varied significantly by treatment. Step-down tests showed the TURBT with intravesical chemotherapy, TURBT with intravesical immunotherapy, and TURBT with intravesical chemotherapy and immunotherapy had significantly higher concerns about the risk of contaminating partners than TURBT only ($p = .03$, $p < .01$, and $p = .03$, respectively). However, the concern about the contaminating partner was not significantly different between TURBT with intravesical immunotherapy and TURBT with intravesical chemotherapy.

Discussion

This study provides further insight into the QOL of the NMIBC population. To the best of our knowledge, there have been no NMIBC QOL studies in which population-based sampling was used. Our study sample was randomly selected from the NMIBC population in North Carolina, which is similar to the demographics of those in the US.

Our findings about the average QLQ-C30 global health status and functioning scores were consistent with those from other studies of NMIBC patients (13,15,16), even though the mean time since diagnosis in our study (3.4 ± 1.5 years, range 1–6 years) was longer than other studies (right after the induction instillation cycle – up to two years post-diagnosis). Although there is a limitation in direct comparison, our evidence suggests there is little to no benefit farther from time of diagnosis in the global health status and functioning. The average symptom scores of QLQ-C30 were similar to other studies (13,15,16) except for fatigue, insomnia, and financial difficulties. In our study, the NMIBC survivors, whose mean time since diagnosis was 3.4 ± 1.5 years, had worse symptoms of fatigue and insomnia and higher financial difficulties than the survivors in other NMIBC studies in which they were measured after the intravesical treatment or one year after the end of the maintenance cycle (two years post-diagnosis) (13,15,16).

The higher financial difficulties in our study (longer mean time since diagnosis) than those in the other studies may suggest NMIBC survivors continuously face financial problems due to bladder cancer care and surveillance. Multiple studies defined bladder cancer as having the highest cost to the health system per patient, from diagnosis to death among all cancer types (8,9). However, little work has been done to understand how financial burden affects the NMIBC survivors and their access to medical care. While we are learning more about financial toxicity in cancer patients (17,18), further research is needed to understand the financial burden in NMIBC populations to ultimately reduce their financial burden.

The global health status of our study (73.6 ± 21.7) was better than genitourinary cancer patients (62.6 ± 22.2) in the EORTC reference (19) and patients with bladder cancer (both NMIBC and MIBC; 43.5 ± 22.8) in a previous study (14). Also, the average functioning and symptoms scores of QLQ-C30 in our study indicate better QOL than those of the genitourinary cancer patients in the EORTC reference and the bladder cancer patients in the previous study (14). However, the genitourinary cancer of the EORTC reference were mainly kidney cancer (76%), followed by other genitourinary cancer (18%) and bladder cancer (5%). Also, the participants of the previous study (14) had mostly MIBC (64%), and only 26% had NMIBC (another 10% were unknown). Because 82% of the participants had cystectomies in the previous study (14), we suspect these participants had lower global health status, lower functioning, and worse symptoms than those in our study.

Although NMIBC-specific symptoms and sexual function in this study seemed to be better than those right after induction intravesical therapy and one year after the end of the maintenance intravesical therapy in the other NMIBC study (13) using the same instrument (QLQ-NMIBC 24), we found one- to six-year NMIBC survivors still reported urinary symptoms, future worries, sexual intimacy problems, and male/female sexual problems (erectile difficulty, ejaculation problem, or vaginal dryness). One possible reason for persistent symptoms is prevalent use of maintenance therapy in high risk NMIBC. Our findings about sexual problems are supported by a previous mixed-methods study (20). The previous study also demonstrated that NMIBC participants (mean age was 65 years), who had been diagnosed within four years, reported sexual dysfunction such as erectile difficulty (60% of sexually active males), ejaculation problem (43% of sexually active males), and vaginal dryness (63% of sexually active females). This prevalence of sexual dysfunction in

NMIBC survivors was much higher than that in another study with community-dwelling older adults (57 to 85 years) in the US (21). This study reported that, in community-dwelling older adults, 37% of sexually active males experienced erectile difficulty and 39% of sexually active females experienced vaginal dryness.

In our study, global health status and most functions and symptoms did not vary by sex, but bowel problems and sexual issues did. Schmidt et al. (22) found no difference in QOL (physical, mental, urinary, bowel, and sexual QOL) by sex in NMIBC patients within a year of diagnosis. The findings could be different from ours due to the use of different QOL instruments and time since diagnosis (our study population was at least one-year post-diagnosis). However, the differences in sexual issues by sex are also shown in some other studies (20,23), which reported males were significantly more sexually active than females.

Interestingly, QOL did not vary by time since diagnosis except for sexual function in this study, which is consistent with other studies (20,24,25). These findings suggest NMIBC survivors had lifelong burdens different from those associated with other cancers. For many other cancers, including MIBC, there is a relatively intense period of treatment (major surgery and potentially chemotherapy/radiation) shortly after diagnosis; patients then shift into survivorship mode, which is often relatively static, with noninvasive (scan-based) surveillance, and relatively less frequent recurrence. However, the NMIBC population has much higher rates of recurrence (> 40%) than most cancers, requiring frequent invasive surveillance and prevalent intravesical treatments, and this might be a burden affecting their QOL for the rest of their lives. Allareddy et al. (24) showed QOL did not differ by time since diagnosis in long-term bladder cancer survivors (both NMIBC and MIBC). In addition, one cross-sectional study (25), which compared two independent bladder cancer cohorts (patients who completed the survey before diagnosis and individuals who completed the survey after diagnosis), reported significant differences of mental and physical QOL between the pre- and post-diagnoses (5 years for mental QOL; 10 years for physical QOL) groups. The post-diagnosis group had lower mental and physical QOL than the pre-diagnosis group. These findings suggest that QOL decreases significantly after a cancer diagnosis and does not improve for many years. However, these findings should be interpreted with caution, because of their cross-sectional nature (24,25). Thus, a longitudinal study should provide a better understanding of QOL by time since diagnosis. In our study, sexual function (the extent of sexual activity and interest in sex) was better in survivors who were farther from the time of diagnosis. Kowalkowski et al. (20) also found time since diagnosis was significantly longer in participants who had an interest in sex than those who had no interest in sex.

Stage Ta had significantly better global health status than Tis and better QOL (physical, role, and social functions, fatigue, dyspnea, and financial difficulties) than T1. Stages Ta and T1 had significantly lower intravesical treatment issues than Tis. One possible explanation for these findings is that at stage Ta there is often a lower risk of progression, so patients diagnosed at stage Ta less commonly receive intravesical immunotherapy or other treatments. However, considering intravesical immunotherapy is generally used more in Tis, as well as T1, the finding where only Tis appears to be substantially different to the other two (T1 and Ta) for intravesical treatment issues may be explained in part by the small

number of participants at stage Tis (n=24, 6.4%). Stage Tis may also have a different intrinsic symptom burden related to the cancer itself.

The cystectomy group had more sexual issues than the non-cystectomy group, which is in agreement with previous studies (24,26). However, there were no significant differences in general health status, functions (physical, role, emotional, cognitive, and social functions), and common cancer symptoms between the cystectomy and the non-cystectomy groups. In addition, our findings suggest the TURBT only group had significantly less concerns about the risk of contaminating their partners than the other treatment groups (TURBT + chemotherapy, TURBT + immunotherapy, TURBT + chemotherapy + immunotherapy), whereas there were no significant differences between the immunotherapy and chemotherapy groups.

This study has several limitations. Firstly, because we used a cross-sectional design, we are not able to infer longitudinal changes in QOL. Also, we did not have pre-treatment baseline QOL data for comparison; thus, potential differences in the baseline characteristics of participants exist. A longitudinal study, which is currently lacking in the literature on QOL in the NMIBC population, would provide better information about QOL changes over time. Another limitation of this study is the lower response rate (23.6%). Population-based sample from state registry without a physician's letter for recruitment may have affected the response rate. Third, while the NMIBC population was predominantly white (89.5%, this is reflective of the demographics of bladder cancer in the US in general), the participants were more likely white (94.5%) than non-participants (88.1%). Little is known about QOL in minority populations with NMIBC. Thus, more studies should be conducted in a more diverse NMIBC population to confirm the generalizability of our findings to diverse populations. Lastly, the number of survivors in the cystectomy group was low (n=21). Also, the QLQ-NMIBC24 was used to measure QOL for the cystectomy group in this study as we wanted to have a uniform comparison using the same instrument across the whole NMIBC population. The QLQ-BLM-30, which is designed to assess post-urinary-diversion problems, might be considered to assess QOL specifically for the cystectomy group in future work.

In conclusion, this population-based cross-sectional study showed one to six-year NMIBC survivors had symptoms that persisted including urinary and bowel symptoms, sexual problems, and future worries. Moreover, global health status, functioning (physical, role, social), and financial difficulties differed by cancer stage; and sexual QOL differed by sex and type of treatment. These findings suggest healthcare providers should regularly assess these burdens across the continuum of cancer care for NMIBC survivors through survivorship visits regardless of time since diagnosis. Furthermore, healthcare providers should consider sex, cancer stage, and treatment differences in symptom effects on QOL and provide appropriate care and advice by sex, stage, and treatment. When patients are diagnosed with NMIBC, healthcare providers should give the information about how the diagnosis and treatment can affect QOL and help the patients to make an informed decision about treatment. In addition, more longitudinal studies are needed to better understand the unique needs and other studies are needed to develop and test appropriate supportive care interventions for NMIBC survivors throughout their cancer journey.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Ahrang Jung is supported by Cancer Outcomes Research Program Research Award, Lineberger Comprehensive Cancer Center, UNC; Sigma Theta Tau International, Alpha Alpha Chapter Research Grant; and Linda Waring Matthews Research Fund Scholarship.

REFERENCES

1. Burger M, Catto JWF, Dalbagni G et al. Epidemiology and Risk Factors of Urothelial Bladder Cancer. *Eur Urol* 2013; 63: 234–41. [PubMed: 22877502]
2. Rutherford C, Costa DSJ, King MT, Smith DP, Patel MI. A conceptual framework for patient-reported outcomes in non-muscle invasive bladder cancer. *Support Care Cancer* 2017; 25: 3095–102. [PubMed: 28451912]
3. Cambier S, Sylvester RJ, Collette L et al. EORTC Nomograms and Risk Groups for Predicting Recurrence, Progression, and Disease-specific and Overall Survival in Non-Muscle-invasive Stage Ta-T1 Urothelial Bladder Cancer Patients Treated with 1–3 Years of Maintenance Bacillus Calmette-Guérin. *Eur Urol* 2016; 69: 60–9. [PubMed: 26210894]
4. Sylvester RJ, van der Meijden APM, Oosterlinck W et al. Predicting recurrence and progression in individual patients with stage Ta T1 bladder cancer using EORTC risk tables: a combined analysis of 2596 patients from seven EORTC trials. *Eur Urol* 2006; 49: 466–77. [PubMed: 16442208]
5. Babjuk M, Böhle A, Burger M et al. EAU Guidelines on Non-Muscle-invasive Urothelial Carcinoma of the Bladder: Update 2016. *Eur Urol* 2017; 71:447–61. [PubMed: 27324428]
6. Mohamed NE, Gilbert F, Lee CT et al. Pursuing quality in the application of bladder cancer quality of life research. *Bl Cancer* 2016; 2:139–49. [PubMed: 27376136]
7. Jung A, Nielsen ME, Crandell JL et al. Quality of Life in Non-Muscle-Invasive Bladder Cancer Survivors. *Cancer Nurs* 2019; 42: E21–33. [PubMed: 29863576]
8. Botteman MF, Pashos CL, Redaelli A, Laskin B, Hauser R. The health economics of bladder cancer: a comprehensive review of the published literature. *Pharmacoeconomics* 2003; 21: 1315–30. [PubMed: 14750899]
9. Yeung C, Dinh T, Lee J. The health economics of bladder cancer: an updated review of the published literature. *Pharmacoeconomics* 2014; 32: 1093–104. [PubMed: 25056838]
10. Dillman DA, Smyth JD, Christian LM. Internet, phone, mail, and mixed-mode surveys : the tailored design method. 4th ed. Hoboken: Wiley; 2014 509 p.
11. Aaronson NK, Ahmedzai S, Bergman B et al. The European organization for research and treatment of cancer QLQ-C30: A quality-of-life instrument for use in international clinical trials in oncology. *J Natl Cancer Inst* 1993; 85: 365–76. [PubMed: 8433390]
12. Blazeby JM, Hall E, Aaronson NK et al. Validation and reliability testing of the EORTC QLQ-NMIBC24 questionnaire module to assess patient-reported outcomes in non-muscle-invasive bladder cancer. *Eur Urol* 2014; 66: 1148–56. [PubMed: 24612661]
13. Gontero P, Oderda M, Mehnert A et al. The impact of intravesical gemcitabine and 1/3 dose Bacillus Calmette-Guerin instillation therapy on the quality of life in patients with nonmuscle invasive bladder cancer: results of a prospective, randomized, phase II trial. *J Urol* 2013; 190: 857–62. [PubMed: 23545101]
14. Singer S, Ziegler C, Schwalenberg T, Hinz A, Gotze H, Schulte T. Quality of life in patients with muscle invasive and non-muscle invasive bladder cancer. *Support Care Cancer* 2013; 21: 1383–93. [PubMed: 23238655]
15. Wei L, Li Q, Liang H, Jianbo L. The quality of life in patients during intravesical treatment and correlation with local symptoms. *J Chemother* 2014; 26: 165–8. [PubMed: 24090459]

16. Koga H, Ozono S, Tsushima T et al. Maintenance intravesical bacillus Calmette-Guerin instillation for Ta, T1 cancer and carcinoma in situ of the bladder: randomized controlled trial by the BCG Tokyo Strain Study Group. *Int J Urol* 2010; 17: 759–66. [PubMed: 20604814]
17. Kale HP, Carroll NV. Self-reported financial burden of cancer care and its effect on physical and mental health-related quality of life among US cancer survivors. *Cancer* 2016; 122: 283–9. [PubMed: 26991528]
18. Gordon LG, Merollini KMD, Lowe A, Chan RJ. A Systematic Review of Financial Toxicity Among Cancer Survivors: We Can't Pay the Co-Pay. *Patient - Patient-Centered Outcomes Res* 2017; 10: 295–309.
19. Scott NW, Fayers PM, Aaronson NK et al. EORTC QLQ-C30 Reference Values EORTC Quality of Life Group. Brussels; 2008 p. 419.
20. Kowalkowski MA, Chandrashekar A, Amiel GE et al. Examining sexual dysfunction in non-muscle-invasive bladder cancer: results of cross-sectional mixed-methods research. *Sex Med* 2014; 2: 141–51. [PubMed: 25356311]
21. Lindau ST, Schumm LP, Laumann EO, Levinson W, O'Muirheartaigh CA, Waite LJ. A Study of Sexuality and Health among Older Adults in the United States. *N Engl J Med* 2007; 357: 762–74. [PubMed: 17715410]
22. Schmidt S, Frances A, Lorente Garin JA et al. Quality of life in patients with non-muscle-invasive bladder cancer: one-year results of a multicentre prospective cohort study. *Urol Oncol* 2015; 33: 19.e7–15.
23. van der Aa MNM, Bekker MD, van der Kwast TH et al. Sexual function of patients under surveillance for bladder cancer. *BJU Int* 2009; 104: 35–40. [PubMed: 19154473]
24. Allareddy V, Kennedy J, West MM, Konety BR. Quality of life in long-term survivors of bladder cancer. *Cancer* 2006; 106: 2355–62. [PubMed: 16649218]
25. Fung C, Pandya C, Guancial E et al. Impact of bladder cancer on health related quality of life in 1,476 older Americans: a cross-sectional study. *J Urol* 2014; 192: 690–5. [PubMed: 24704007]
26. Gilbert SM, Wood DP, Dunn RL et al. Measuring health-related quality of life outcomes in bladder cancer patients using the Bladder Cancer Index (BCI). *Cancer* 2007; 109: 1756–62. [PubMed: 17366596]

Figure 1. Research flowchart.

Abbreviation: NMIBC, non-muscle-invasive bladder cancer.

Table 1.

Included Participants* Demographic and Clinical Characteristics from NC Central Cancer Registry and Survey

Characteristic	Participants (n=376*)
Sex [†]	
Male	272 (72.3%)
Female	104 (27.7%)
Age at diagnosis, years [†]	
Mean (SD), Range	68.3 (9.2), 34–89
Age at enrollment, years [†]	
Mean (SD), Range	72.2 (9.2), 39–94
Race [†]	
White	355 (94.4%)
African American	13 (3.5%)
Other	2 (0.5%)
Unknown	6 (1.6%)
Ethnicity [†]	
Non-Hispanic	369 (98.1%)
Hispanic	1 (0.3%)
Unknown	6 (1.6%)
Annual income	
< \$50,000	132 (35.1%)
\$50,000- \$99,999	136 (36.2%)
\$100,000	62 (16.5%)
No response given	46 (12.2%)
Education	
High school graduate	89 (23.7%)
Some college or technical school/College graduate	210 (55.9%)
Post-graduate	65 (17.3%)
No response given	12 (3.2%)
Marital status	
Married/ Living with partner	284 (75.5%)
Never married/ Divorced/ Widowed/ Separated	80 (21.3%)
No response given	12 (3.2%)
Employment	
Employed	71 (18.9%)
Unemployed	20 (5.3%)
Retired	274 (72.9%)
No response given	11 (2.9%)
Histology [†]	
Papillary transitional cell carcinoma	312 (83.0%)
Transitional cell carcinoma	62 (16.5%)

Characteristic	Participants (n=376 [*])
Other	2 (0.5%)
Stage at diagnosis [†]	
Ta	250 (66.5%)
Tis	24 (6.4%)
T1	102 (27.1%)
Years since diagnosis [†]	
Mean (SD), Range	3.4 (1.5), 1–6
All types of previous treatment	
TURBT	276 (73.4%)
Immunotherapy	163(43.4%)
Chemotherapy	136 (36.2%)
Cystectomy	21 (5.6%)
Radiation therapy	3 (0.8%)
Other	14 (3.7%)
No treatment selected	11 (2.9%)
Previous Treatment	
TURBT only	88 (24.7%)
TURBT+ Chemotherapy	94 (26.3%)
TURBT+ Immunotherapy	123 (34.5%)
TURBT+ Chemotherapy+ Immunotherapy	31 (8.7%)
Cystectomy	21 (5.9%)
Current treatment status	
Not in treatment	299 (79.5%)
Receiving treatment	71 (18.9%)
No response given	6 (1.6%)

^{*} 22 respondents, who did not complete the main outcome (quality of life) instrument, were excluded in the analysis.

[†] Data from NC central cancer registry.

Abbreviations: NC, North Carolina; SD, standard deviation; TURBT, transurethral resection of bladder tumor.

Table 2.

Quality of Life Scores

Measure	Characteristic	n	Mean (SD)	Observed Range
EORTC QLQ-C30	Global health status	364	73.6 (21.7)	0 – 100
	Physical functioning	376	84.6 (20.3)	6.7–100
	Role functioning	376	86.5 (23.9)	0 – 100
	Emotional functioning	376	84.4 (21.0)	0 – 100
	Cognitive functioning	376	83.9 (21.3)	0 – 100
	Social functioning	376	84.8 (25.1)	0 – 100
	Fatigue [†]	376	23.6 (25.6)	0 – 100
	Nausea and vomiting [†]	376	5.1 (12.0)	0 – 66.7
	Pain [†]	376	16.4 (25.3)	0 – 100
	Dyspnea [†]	376	17.1 (27.2)	0 – 100
	Insomnia [†]	374	24.3 (30.4)	0 – 100
	Appetite loss [†]	374	9.0 (20.5)	0 – 100
	Constipation [†]	374	13.7 (24.9)	0 – 100
	Diarrhea [†]	375	9.2 (18.8)	0 – 100
	Financial difficulties [†]	376	14.1 (26.2)	0 – 100
EORTC QLQ-NMIBC24	Urinary symptoms [†]	375	23.5(22.2)	0 – 100
	Malaise [†]	376	5.0 (11.8)	0 – 83.3
	Future worries [†]	376	23.5 (22.7)	0 – 100
	Bloating & flatulence [†]	376	20.5 (21.5)	0 – 100
	Sexual function	368	31.5 (27.2)	0 – 100
	Intravesical treatment issues [†]	375	7.4 (18.8)	0 – 100
	Sexual intimacy [†]	352	27.9 (35.0)	0 – 100
	Risk of contaminating partner [†]	350	9.7 (23.7)	0 – 100
	Sexual enjoyment	327	48.1 (38.1)	0 – 100
	Male sexual problems [†]	261	48.5 (35.7)	0 – 100
	Female sexual problems [†]	83	39.0 (39.2)	0 – 100

Note. Possible range of scores is 0–100. Higher scores denote better quality of life except for those marked with [†].

[†]High scores denote poorer quality of life in these domains.

Abbreviations: EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30; NMIBC24, 24-item non-muscle-invasive bladder cancer module; SD, standard deviation.

Table 3.

Quality of Life by Sex, Stage, and Years since Diagnosis

	Global health status (n=364)	Physical Functioning (n=376)	Role Functioning (n=376)	EORTC QLQ-C30 Mean (SD)				Fatigue (n=376)
				Emotional Functioning (n=376)	Cognitive Functioning (n=376)	Social Functioning (n=376)		
Sex								
Male	72.5 (21.4)	84.5 (20.6)	85.7 (24.4)	85.1 (21.3)	84.2 (21.4)	84.5 (25.1)	23.6 (25.3)	
Female	76.7 (22.3)	84.9 (19.7)	88.8 (22.5)	82.8 (20.4)	82.9 (21.0)	85.7 (25.3)	23.3 (26.6)	
p-value ^a	.10	.89	.26	.33	.57	.67	.92	
Stage								
Ta	75.7 (20.6)	86.6 (18.8)	88.7 (21.5)	85.8 (19.6)	85.1 (20.4)	87.7 (22.2)	21.1(24.5)	
Tis	64.9 (23.8)	80.6 (22.9)	83.3 (29.5)	82.2 (24.2)	79.8 (23.1)	79.9 (31.8)	28.2 (26.6)	
T1	70.8 (22.9)	80.7 (22.6)	81.9 (27.3)	81.6 (23.4)	81.7 (22.8)	78.9 (28.8)	28.5 (27.4)	
p-value ^b	.02	.03	.04	.20	.25	.01	.03	
Years since diagnosis								
1	72.5 (18.2)	85.3 (16.4)	90.8 (20.2)	89.4 (19.1)	86.8 (16.3)	89.1 (22.4)	20.9 (21.8)	
2	73.8 (21.0)	84.1 (21.5)	87.2 (23.4)	83.9 (19.9)	82.8 (18.2)	85.6 (23.0)	22.7 (23.6)	
3	78.0 (20.1)	87.7 (17.7)	88.3 (22.3)	85.2 (22.2)	88.1 (19.0)	86.7 (24.9)	19.7 (23.8)	
4	67.8 (24.1)	82.1 (22.9)	81.3 (28.7)	80.3 (24.2)	79.6 (26.2)	77.6 (31.3)	27.2 (28.8)	
5	74.5 (23.8)	84.8 (21.0)	85.9 (24.2)	85.9 (19.0)	83.3 (23.2)	85.4 (24.6)	26.0 (28.1)	
6	73.8 (19.7)	83.5 (19.3)	87.9 (21.4)	85.3 (19.8)	83.7 (22.8)	87.5 (19.9)	25.1 (26.8)	
p-value ^c	.72	.64	.41	.72	.48	.57	.18	
Treatment ^d								
TURBT only	74.8 (19.1)	83.6 (21.3)	89.2 (22.0)	87.2 (16.6)	87.9 (16.3)	87.3 (24.8)	21.3 (24.8)	
TURBT+ Chemo	68.4 (23.4)	82.7 (22.1)	83.2 (25.1)	83.8 (22.1)	82.1 (24.0)	82.1 (25.9)	27.3 (26.9)	
TURBT+ Immuno	76.3 (22.1)	87.2 (18.5)	88.8 (21.4)	84.3 (21.2)	82.9 (20.5)	87.3 (21.9)	21.7 (25.3)	
TURBT+Chemo +Immuno	76.1 (21.1)	85.3 (19.4)	83.3 (29.5)	80.4 (26.3)	86.0 (24.4)	80.1 (31.5)	20.4 (27.1)	
Cystectomy	75.0 (18.9)	88.6 (15.1)	89.7 (17.9)	81.0 (21.3)	79.4 (25.2)	84.9 (21.7)	23.8 (23.7)	
p-value ^e	.10	.44	.28	.50	.26	.36	.46	

EORTC QLQ-C30 Mean (SD)									
	Global health status (n=364)	Physical Functioning (n=376)	Role Functioning (n=376)	Emotional Functioning (n=376)	Cognitive Functioning (n=376)	Social Functioning (n=376)	Fatigue (n=376)		
p-value ^d	.79	.41	.58	.45	.31	.97	.90		
p-value ^e	.05	.40	.20	.43	.23	.23	.31		

EORTC QLQ-C30 Mean (SD)									
	Nausea and Vomiting (n=376)	Pain (n=376)	Dyspnea (n=376)	Insomnia (n=374)	Appetite loss (n=374)	Constipation (n=374)	Diarrhea (n=375)	Financial difficulties (n=376)	
Sex									
Male	4.4 (10.6)	16.7 (25.3)	17.5 (27.3)	22.5 (29.9)	9.0 (20.4)	11.6 (22.5)	7.6 (16.9)	14.1 (26.3)	
Female	6.7 (15.2)	15.4 (25.5)	16.0 (27.1)	29.1 (31.2)	9.1 (20.1)	19.3 (29.8)	13.6 (22.6)	14.1 (26.2)	
p-value ^a	.09	.65	.63	.06	.97	.02	.02	.99	
Stage									
Ta	4.1 (11.4)	14.9 (24.8)	14.7 (25.1)	22.9 (30.1)	8.2 (19.4)	12.4 (22.4)	7.9 (17.3)	10.7 (22.4)	
Tis	7.6 (13.9)	20.2 (27.8)	25.0 (39.6)	29.2 (33.1)	11.1 (23.4)	18.2 (32.1)	10.1 (15.7)	20.8 (30.8)	
T1	6.7 (12.9)	19.1 (25.8)	21.2 (28.1)	26.7 (30.6)	10.6 (22.6)	16.0 (28.8)	12.4 (22.5)	20.9 (31.8)	
p-value ^b	.11	.27	.04	.41	.54	.32	.12	< .01	
Years since diagnosis									
1	3.5 (8.2)	17.2 (19.2)	16.1 (27.6)	25.3 (26.2)	14.9 (26.1)	8.0 (19.2)	5.7 (12.8)	12.6 (27.3)	
2	3.8 (10.4)	15.3 (21.6)	18.1 (26.5)	25.7 (30.4)	8.8 (20.2)	14.9 (25.1)	10.1 (20.6)	14.6 (25.5)	
3	5.2 (12.9)	13.1 (23.5)	12.1 (20.7)	22.4 (31.5)	5.5 (18.0)	11.7 (26.6)	11.2 (20.5)	13.3 (26.3)	
4	6.2 (12.3)	20.2 (32.3)	21.4 (31.1)	25.8 (31.9)	8.0 (19.3)	15.2 (24.9)	9.6 (19.2)	19.4 (31.3)	
5	7.3 (15.1)	17.2 (27.2)	13.5 (26.4)	25.5 (31.8)	13.0 (24.2)	15.1 (23.7)	7.3 (15.1)	10.4 (23.7)	
6	3.3 (10.1)	17.1 (25.2)	24.2 (32.9)	20.0 (27.0)	7.5 (16.0)	14.5 (27.4)	8.3 (19.6)	12.5 (20.9)	
p-value ^c	.29	.49	.41	.60	.92	.42	.70	.72	
Treatment ^f									
TURBT only	3.6 (10.6)	15.3 (24.5)	17.0 (26.3)	26.5 (29.5)	8.3 (19.7)	14.3 (24.8)	8.4 (19.2)	11.4 (23.1)	
TURBT+ Chemo	7.1 (14.8)	20.4 (28.0)	22.0 (29.2)	24.4 (31.1)	11.6 (22.9)	14.5 (27.0)	9.6 (19.3)	15.6 (25.3)	
TURBT+ Immuno	4.2 (10.4)	13.4 (22.6)	13.6 (25.6)	21.9 (29.9)	8.4 (20.3)	11.4 (22.9)	7.3 (15.7)	13.6 (28.3)	

EORTC QLQ-C30 Mean (SD)									
	Nausea and Vomiting (n=376)	Pain (n=376)	Dyspnea (n=376)	Insomnia (n=374)	Appetite loss (n=374)	Constipation (n=374)	Diarrhea (n=375)	Financial difficulties (n=376)	
TURBT+Chemo+Immuno	4.3 (10.5)	17.2 (26.7)	12.9 (26.8)	22.6 (30.3)	5.4 (21.3)	12.9 (25.4)	9.7 (17.6)	12.9 (26.8)	
Cystectomy	8.7 (16.4)	11.9 (18.4)	15.9 (27.1)	23.8 (30.1)	12.7 (19.7)	15.9 (27.1)	17.5 (29.1)	19.0 (27.0)	
p-value ^b	.16	.29	.20	.86	.53	.86	.24	.71	
p-value ^d	.30	.44	.88	.99	.43	.63	.18	.34	
p-value ^e	.19	.23	.12	.73	.47	.77	.80	.75	

EORTC QLQ-NMIBC24 Mean (SD)									
	Urinary symptoms (n=375)	Malaise (n=376)	Future worries (n=376)	Bloating & flatulence (n=376)	Intravesical treatment issues (n=375)	Risk of contaminating partner (n=350)			
Sex									
Male	23.2 (22.6)	5.3 (12.3)	23.1 (22.6)	19.6 (19.7)	7.1 (18.1)	11.4 (25.7)			
Female	24.5 (21.3)	4.0 (10.3)	24.3 (23.2)	23.1 (25.8)	8.0 (20.5)	5.0 (16.3)			
p-value ^a	.60	.29	.66	.21	.69	.03			
Stage									
Ta	21.9 (20.5)	4.1 (10.2)	22.6 (21.4)	20.1 (21.5)	6.1 (18.1)	9.4 (23.3)			
Tis	31.6 (30.1)	7.6 (13.9)	30.0 (30.1)	19.5 (20.1)	16.7 (29.5)	16.7 (32.6)			
T1	25.8 (23.8)	6.4 (14.5)	24.1 (23.8)	21.7 (22.1)	8.2 (16.6)	8.8 (21.9)			
p-value ^b	.06	.14	.30	.79	.03	.32			
Years since diagnosis									
1	22.6 (18.7)	5.2 (10.1)	23.3 (20.9)	19.6 (23.2)	0 (0)	6.4 (21.1)			
2	23.5 (22.9)	4.7 (12.5)	24.7 (24.4)	22.2 (23.4)	5.9 (16.0)	14.6 (28.6)			
3	22.7 (24.0)	4.4 (11.2)	20.5 (22.7)	20.0 (21.0)	5.8 (13.8)	7.3 (20.2)			
4	25.6 (24.3)	7.7 (15.2)	28.0 (23.7)	22.9 (22.3)	13.9 (27.3)	6.3 (18.7)			
5	22.3 (21.3)	4.7 (9.6)	23.0 (21.9)	17.7 (19.4)	9.4 (20.1)	10.6 (23.4)			
6	24.5 (17.4)	2.5 (8.1)	19.6 (19.0)	18.8 (19.3)	5.0 (17.8)	10.0 (26.4)			
p-value ^c	.81	.69	.63	.40	.07	.61			

Treatment [§]	EORTC QLQ-NMIBC24 Mean (SD)					Risk of contaminating partner (n=350)
	Urinary symptoms (n=375)	Malaise (n=376)	Future worries (n=376)	Bloating & flatulence (n=376)	Intravesical treatment issues (n=375)	
TURBT only	20.7 (18.5)	4.0 (9.8)	19.7 (20.1)	19.1 (21.7)	4.2 (17.4)	2.8 (11.9)
TURBT+ Chemo	27.3 (23.5)	5.9 (12.9)	26.6 (22.4)	22.0 (23.3)	9.9 (20.6)	10.6 (24.8)
TURBT+ Immuno	23.3 (22.1)	4.8 (12.2)	24.1 (23.9)	20.9 (20.9)	8.2 (20.2)	12.3 (27.1)
TURBT+Chemo+Immuno	27.0 (27.1)	5.4 (9.0)	23.9 (26.1)	20.4 (19.1)	6.5 (15.9)	13.8 (26.0)
Cystectomy	N/A	3.2 (10.0)	20.6 (22.5)	15.9 (20.7)	6.3 (13.4)	13.3 (27.4)
p-value ^b	N/A	.78	.33	.77	.34	.04
p-value ^d	N/A	.50	.56	.32	.79	.48
p-value ^e	.19	.74	.24	.85	.23	.02

Sex	EORTC QLQ-NMIBC24 Mean (SD)					Female sexual problems (n=83)
	Sexual function (n=368) +	Sexual intimacy (n=352) -	Sexual enjoyment (n=327) +	Male sexual problems (n=261) -		
Male	35.9 (27.2)	30.6 (35.5)	53.2 (37.4)	N/A	N/A	
Female	19.8 (23.7)	20.3 (32.8)	32.9 (35.7)			
p-value ^a	<.0001	.01	<.0001			
Stage						
Ta	33.2 (27.6)	25.7 (33.8)	48.2 (37.4)	47.2 (35.1)	42.2 (40.0)	
Tis	29.2 (28.8)	34.7 (37.4)	49.2 (43.0)	53.5 (35.0)	25.0 (31.9)	
T1	28.0 (25.6)	31.6 (37.3)	47.6 (38.5)	50.0 (37.3)	28.9 (37.5)	
p-value ^b	.25	.24	.98	.70	.39	
Years since diagnosis						
1	26.4 (28.7)	22.2 (37.0)	37.3 (41.2)	38.0 (37.4)	33.3 (43.6)	
2	30.0 (26.1)	24.2 (33.8)	45.5 (38.7)	44.6 (33.7)	37.3 (42.3)	
3	30.3 (27.3)	24.1 (31.8)	48.0 (37.1)	46.5 (34.6)	42.1 (36.6)	
4	32.3 (27.9)	36.4 (38.1)	48.6 (37.8)	51.0 (34.4)	30.6 (46.0)	
5	30.6 (25.6)	31.1 (35.7)	52.7 (40.4)	59.8 (40.0)	41.2 (34.4)	

EORTC QLQ-NMIBC24 Mean (SD)					
	Sexual function (n=368)	Sexual intimacy (n=352)	Sexual enjoyment (n=327)	Male sexual problems (n=261)	Female sexual problems (n=83)
	+	-	+	-	-
6	41.2 (29.2)	28.3 (35.0)	53.5 (32.5)	48.2 (35.8)	46.7 (42.2)
p-value ^c	.04	.10	.06	.12	.56
Treatment[§]					
TURBT only	29.6 (28.9)	26.8 (33.9)	48.9 (38.9)	52.3 (35.0)	29.5 (38.1)
TURBT+ Chemo	31.2 (27.0)	27.6 (34.2)	46.7 (39.2)	48.7 (36.8)	31.9 (34.1)
TURBT+ Immuno	34.8 (26.2)	23.9 (33.3)	52.9 (36.4)	41.1 (32.7)	54.4 (41.9)
TURBT+Chemo+Immuno	29.4 (26.5)	29.8 (35.5)	42.9 (37.3)	57.9 (36.4)	51.9 (37.7)
Cystectomy	15.8 (20.6)	50.0 (39.7)	26.3 (36.1)	66.7 (36.5)	33.3 (57.7)
p-value ^b	.06	.04	.07	.03	.18
p-value ^d	< .01	< .01	.01	.03	.81
p-value ^e	.51	.80	.53	.11	.09

Note. Possible range of scores is 0–100.

[†] Higher score indicates better QOL;

[‡] Higher score indicates worse QOL.

^a p-value from t-test;

^b p-value from one-way ANOVA;

^c p-value from Pearson's correlation;

^d p-value for post-hoc t-test of cystectomy vs. non-cystectomy;

^e p-value for post-hoc ANOVA within the 4 non-cystectomy treatments (i.e., excluding cystectomy).

[§] Treatment data were not complete; n=345 for global health status; n=357 for function, symptom, malaise, future worries, and bloating & flatulence; n=356 for urinary symptom, intravesical treatment issues; n=349 for sexual function; n=333 for sexual intimacy; n=331 for risk of contaminating partner; n=309 for sexual enjoyment; n=246 for male sexual problems; n=80 for female sexual problems.

Abbreviations: EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30; N/A, not applicable; NMIBC24, 24-item non-muscle-invasive bladder cancer module; SD, standard deviation; TURBT, transurethral resection of bladder tumor.